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National Highway Traffic Safety Administration

Anthropomorphic Test Dummies Representing 6-Month-Old and 3-Year-Old Children; Response to Petition and Correction of Final Rule

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 572

[Docket No. 78-09; Notice 6]

Anthropomorphic Test Dummies Representing 6-Month-Old and 3-Year-Old Children; Response to Petition; Correction of Final Rule

AGENCY: National Highway Traffic Safety Administration (NHTSA).

ACTION: Response to petition for reconsideration and correction of final rule.

SUMMARY: This notice grants in part and denies in part a General Motors (GM) petition for reconsideration of the 3-year-old test dummy requirements set in Part 572, *Anthropomorphic Test Dummies*. GM said it could not calibrate its test dummies because of resonances in the dummies, which prevent accurate acceleration measurements. NHTSA found that GM's calibration problems are due to its failure to comply with all of the design specifications set for the dummy and its use of single axis rather than triaxial accelerometers. In another notice in today's **Federal Register** the agency is proposing to require the use of triaxial accelerometers. This notice also corrects typographical errors in the final rule.

DATES: The amendments are effective on June 26, 1980.

FOR FURTHER INFORMATION CONTACT: Mr. Vladislav Radovich, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration. 400 Seventh Street, SW., Washington, D.C. 20590 (202-426-2264).

SUPPLEMENTARY INFORMATION: On December 27, 1979, NHTSA published in the **Federal Register** a final rule amending Part 572, *Anthropomorphic Test Dummies*, to establish specifications and performance requirements for two test dummies, one representing a 6-month-old child and the other representing a 3-year-old child (44 FR 76527). The dummy is used in testing child restraint systems in accordance with Federal Motor Vehicle Safety Standard No. 213, *Child Restraint Systems*. General Motors (GM) timely filed a petition for reconsideration concerning the specifications and performance requirements set for the test dummy representing a 3-year-old child. No other petitions were filed and GM raised no issues concerning the specifications set for the test dummy representing a 6-month-old child.

In its petition, GM again argued that the 3-year-old test dummy is not an objective test device for acceleration measurement because of resonances in the test dummy. GM requested the agency not to use the dummy as an acceleration measurement device until the resonances are eliminated.

GM also asked the agency to revise its accelerometer specifications to require the axes of triaxial accelerometers to intersect at a single point. GM said the change would reduce possible variability between different types of accelerometers. In addition, GM requested a further change in the lumbar spine test procedures to permit the use of either a pull or a push force during the spine calibration tests.

GM also raised questions about the possible use of different signal filtering techniques at different test laboratories. GM said that the use of different filters might account for differences between its testing and testing done for the agency.

NHTSA has evaluated GM's comments and the agency's responses to GM's petition are discussed below. All requests that are not specifically granted below are denied.

Signal Filtering

GM argued that one of the possible reasons for the differences between the test dummy head calibration test results at GM and other laboratories was the use of incorrect filters (devices used in the electronic processing of the acceleration measurements) by some laboratories. Part 572 requires the acceleration measurements to be filtered according to the Society of Automotive Engineers Recommended Practice J211a. Both Calspan Corporation and the agency's Vehicle Research and Test Center (VRTC), which did testing for NHTSA, used the required filter and instrumented their test dummies with triaxial accelerometers. The test results at VRTC were all within the limits set by the agency.

The Calspan test results originally reported to the agency were also within the limits. In rechecking its data, however, Calspan determined that it had made an error in calculating the peak resultant accelerations in the head calibration test. The corrected data showed that in one of the four head calibration tests the peak resultant acceleration was 116 g's, which exceeds the 115 g limit set in Part 572. To evaluate possible variability in the processing of the data by different laboratories, the agency also had HSRI and VRTC process the Calspan data. For the tests which exceeded the calibration limit, there was little variability between the different laboratories, with HSRI measuring 118 g's and VRTC measuring 117.4 g's.

The dummies Calspan used in the calibration testing were subsequently used in sled tests of child restraint systems. In the sled tests, the dummies provided consistent and repeatable acceleration measurements. Since dummies that experience 118 g's in the head calibration test can provide consistent and repeatable acceleration measurements, the agency, in a separate notice appearing in today's **Federal Register**, is proposing to increase the head resultant acceleration calibration limit from 115 to 118 g's.

NHTSA has found that the University of Michigan's Highway Safety Research Institute (HSRI), which instrumented its dummies with single axis accelerometers, did not use the filter required by Part 572, but instead used a filter that deviates from the required filter. To determine whether the use of the HSRI filter made a difference in the calibration tests conducted by that laboratory, the agency had HSRI process the accelerations recorded during its head calibration tests with the correct filter. Using the correct filter, HSRI found that in five of the eighteen head calibration tests the peak resultant acceleration exceeded the limits set in Part 572. In those five tests, the peak resultant acceleration ranged from 115.9 to 119.1 g's.

The peak resultant accelerations and the shape of the acceleration pulses in the HSRI tests that exceeded the calibration limit were smaller than and not the same shape as the measurements made by GM in its tests, which also used test dummies instrumented with single axis accelerometers. In the two sets of data submitted by GM to the docket, the peak resultant accelerations ranged from 119 to 130 g's. In addition, the shape of the GM head acceleration pulse was different than the pulses measured in all the testing done for the agency. In the GM acceleration pulse, there is a brief secondary peak after initial peak is reached. Based on the agency's testing of adult test dummies, such secondary peaks are usually indications of accelerometer vibration resulting from improper installation.

The differences between the GM testing and the testing done for the agency is not attributable to the use of different filters. When all the test data is filtered as specified in the standard, the peak resultant accelerations measured by GM are still greater than those obtained at the other three laboratories. As explained below, use of triaxial accelerometers, rather than the single

axis accelerometers used by GM and HSRI, will provide repeatable, complying results in the head calibration test.

Instrumentation

Part 572 allows the use of two different types of accelerometers (single axis and triaxial) in the test dummy and sets different axis intersection requirements for each type of accelerometer. GM asked the agency to apply the axis intersection requirements set for single axis accelerometers to triaxial accelerometers. It said such a requirement would reduce the variability in test measurements resulting from use of different types of accelerometers.

The agency's testing has demonstrated that variability can be sufficiently controlled by use of the existing specification with a triaxial accelerometer. Testing done by GM has also shown that the test dummy can be properly calibrated with triaxial accelerometers. When GM tested one of the agency's test dummies with GM's accelerometer mounting plate and single axis accelerometers, the peak lateral accelerations measured in the test dummy's head exceeded the limits currently set in the regulation. Yet when GM tested the same test dummy equipped with triaxial accelerometers placed on the mounting plate required by the design specifications, the test dummy easily met the calibration requirements. Therefore, rather than adopt GM's proposal, the agency is proposing, elsewhere in today's **Federal Register**, to require the use of only triaxial accelerometers.

Resonances

GM said that "the consistent lack of correlation between dummy tests at General Motors and at other laboratories" was attributable to resonances in the test dummy. It said the dummy could not be used as an objective test device until the resonances were eliminated. As explained previously, the variability between different test laboratories can be controlled by the use of triaxial accelerometers.

One reason for the "resonances" in the GM test results may be GM's failure to use dummies that fully comply with the agency's design specifications. The agency's review of some of the blueprints used in the construction of the GM test dummies revealed that GM did not use the accelerometer mounting plate required by the NHTSA design specifications. The mounting plate used by GM was smaller and presumably lighter than the plate specified by the agency. Use of a smaller and lighter plate may have also contributed to the higher acceleration readings obtained by GM.

Thus, the agency denies GM's request not to use the dummy for acceleration measurement and concludes that the 3-year-old test dummy instrumented with triaxial accelerometers is an objective test device for measuring accelerations in child restraints.

Spine Calibration

The calibration requirements for the lumbar spine of the test dummy specify the amount of flexion the spine must experience when force is applied to it. The calibration procedures specify that the applied force is to be applied as a pull force. GM requested the agency to permit the use of a "push" force saying that it "is more convenient to apply in some test set-ups."

When the agency developed the spine calibration tests, both pull and push forces were used to apply force to the spine. However, the testing done by the Highway Safety Research Institute (HSRI) found that use of a push force "proved to be awkward and inconsistent." HSRI also found that use of a pull force was a simpler procedure and provided codnsistent data. Based on the HSRI testing, the agency has decided to deny GM's request since the use of a pull force provides a simple, repeatable method to measure compliance.

Corrections

In the final rule issued on December 12, 1979, NHTSA amended the instrumentation requirements for the chest to more specifically define several of the accelerometers mounting locations. The revised specifications inadvertently reversed two of the axis mounting locations in the chest. The specifications have been amended in this notice to correct that error.

The test procedure for conducting the head impact test set forth in the final rule contained a typographical error. The tolerance for positioning the test probe was listed as ± 1.1 inches. The regulation has been amended in this notice to specify the correct tolerance of ± 0.1 inches.

The performance requirement for the neck calibration test was incorrectly listed as 84 degrees ± 18 degrees rather than the correct figure of 84 degrees ± 8 degrees. The necessary corrections have been made in this notice to the regulation.

The principal authors of this notice are Vladislav Radovich, Office of Vehicle Safety Standards, and Stephen Oesch, Office of Chief Counsel.

PART 572—ANTHROPOMORPHIC TEST DUMMIES

In consideration of the foregoing, Subpart C—3-Year-Old Child of Part 572, *Anthropomorphic Test Dummies*, of Title 49 of the Code of Federal Regulations is amended as follows:

1. Section 572.1(c)(2) is amended to read as follows:

§ 572.1 Scope.

* * * * *

(c) * * *

(2) Adjust the test probe so that its longitudinal centerline is at the forehead at the point of orthogonal intersection of the head midsagittal plane and the transverse plane which is perpendicular to the "Z" axis of the head (longitudinal centerline of the skull anchor) and is located 0.6 ± 0.1 inches above the centers of the head center of gravity reference pins and coincides within 2 degrees with the line made by the intersection of horizontal and midsagittal planes passing through this point.

2. The first sentence of § 572.17(b) is amended to read as follows:

§ 572.17 Neck.

* * * * *

(b) When the head-neck assembly is tested in accordance with paragraph (c) of this section, the head shall rotate in reference to the pendulum's longitudinal centerline a total of 84 degrees ± 8 degrees about its center of gravity, rotating to the extent specified in the following table at each indicated point in time, measured from impact, with the chordal displacement measured at its center of gravity.

3. Section 572.21(c) is amended to read as follows:

§ 572.21 Test conditions and instrumentation.

* * * * *

(c) Accelerometers are mounted in the thorax on the mounting plate attached to the vertical transverse bulkhead shown in the drawing subreferenced under assembly No. SA 103C 030 in drawing SA 103C 001 so that their sensitive axes are orthogonal and their seismic masses are positioned relative to the axial intersection point located in the midsagittal plane 3 inches above the top surface of the lumbar spine and 0.3 inches dorsal to the accelerometer mounting plate surface. Except in the case of triaxial acceleromoters, the sensitive axes shall intersect at the axial intersection point. One accelerometer is aligned with its sensitive axis parallel to the vertical bulkhead and midsagittal planes, and with its seismic mass center at any distance up to 0.2 inches to the left, 0.1 inches inferior and 0.2 inches

ventral of the axial intersection point. Another accelerometer is aligned with its sensitive axis in the transverse horizontal plane and perpendicular to the midsagittal plane and with its seismic mass center at any distance up to 0.2 inches to the right, 0.1 inches inferior and 0.2 inches ventral to the axial intersection point. A third accelerometer is aligned with its sensitive axis parallel to the midsagittal and transverse horizontal planes and with its seismic mass center at any distance up to 0.2 inches superior, 0.5 inches to the right and 0.1 inches ventral to the axial intersection point. In the case of a triaxial accelerometer, its axes are aligned in the same way that the axes of three separate accelerometers are aligned.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50)

Issued on June 17, 1980.

Joan Claybrook,

Administrator.

[FR Doc. 80–18945 Filed 6–19–80; 12:09 pm]

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DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 572

[Docket No. 78-09; Notice 7]

Anthropomorphic Test Dummies Representing 6-Month-Old and 3-Year-Old Children

AGENCY: National Highway Traffic Safety Administration (NHTSA).

ACTION: Notice of proposed rulemaking.

SUMMARY: The instrumentation requirements for the 3-year-old test dummy established by Part 572, *Anthropomorphic Test Dummies,* allow the use of single axis or triaxial accelerometers. The agency is proposing to specify the use of only a triaxial accelerometer in the test dummy to eliminate calibration problems caused by single axis accelerometers. The effect of this proposed amendment is to provide more consistent results and to provide child restraint manufacturers with greater certainty about the instrumentation that the agency will use in its compliance testing.

DATES: Comments on the notice of proposed rulemaking must be received on or before July 28, 1980. Proposed effective date: date of publication of the final rule in the **Federal Register.**

ADDRESSES: Comments should refer to the docket number and be submitted to: Docket Section, Room 5108, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. (Docket hours: 8:00 a.m. to 4:00 p.m.)

FOR FURTHER INFORMATION CONTACT: Mr. Vladislav Radovich, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, D.C. 20590 (202-426-2264).

SUPPLEMENTARY INFORMATION: Elsewhere in today's **Federal Register** is a notice responding to a petition for reconsideration filed by GM on the requirements set in Part 572, *Anthropomorphic Test Dummies,* for the test dummy representing a 3-year-old child. The dummy is used in testing child restraint systems in accordance with Federal Motor Vehicle Safety Standard No. 213, *Child Restraint Systems.* Because of difficulties experienced by GM in calibrating the test dummies with single axis accelerometers, the agency is proposing to amend the regulation to specify the use of triaxial accelerometers in the 3-year-old child test dummy.

Part 572 currently allows manufacturers to use either triaxial accelerometers or single axis accelerometers to measure accelerations in the head and chest of the 3-year-old child test dummy. To reduce the variability in the placement of the different types of accelerometers, the regulation specifies a limited range of permissible accelerometer mounting locations.

However, when GM instrumented its test dummies with single axis accelerometers, the peak resultant accelerations in the head calibration tests exceed the limits set in the regulation. When GM tested one of the agency's test dummies with triaxial accelerometers, the test dummy easily met the head calibration requirements.

Testing done for the agency by the University of Michigan's Highway Safety Research Institute (HSRI) also used single axis accelerometers. In five of the eighteen head calibration tests done by HSRI, the peak resultant acceleration exceeded the limits set in Part 572.

Tests done for NHTSA at Calspan Corp. and the agency's Vehicle Research and Test Center (VRTC) used triaxial accelerometers in the test dummy. In all the tests done by VRTC, the dummies met the calibration requirements set in the regulation. The data originally reported by Calspan to the agency were also within the limits set in Part 572. In rechecking the data, however, Calspan discovered it had made an error in determining the peak resultant accelerations in the head calibration tests. The corrected data show that, in one of the four head calibration tests, the peak resultant accelerations was 116 g's, just above the 115 g limit set in Part 572.

To assess possible variability in acceleration measurements by different test laboratories, the agency had HSRI and VRTC reprocess the data from the Calspan head calibration tests. In the test in which Calspan measured 116 g's, VRTC measured 117.6 g's and HSRI measured 118 g's. A copy of the results from this testing has been placed in the docket. To accommodate these minor variations in test measurements, the agency is proposing to increase the resultant acceleration limit for the head calibration test from 115 g's to 118 g's. Although the agency is proposing to expand the upper limit of the calibration range, experience with the Part 572 adult test dummy has shown that manufacturers will develop production techniques to produce test dummies that have acceleration responses that fall within the middle of the specified calibration range.

The dummies Calspan used in its calibration testing were subsequently used in sled tests of child restraint systems. In the sled tests, the dummies, which were equipped with triaxial accelerometers, provided consistent and repeatable acceleration measurements. Since triaxial accelerometers have provided consistent and repeatable results in both calibration and sled tests of child restraints, the agency is proposing to require their use.

Use of the triaxial accelerometer is the least restrictive approach the agency can take consistent with the current mounting location requirements set in the regulation. The axes and seismic mass centers of a triaxial accelerometer are located at the maximum distance from the specified reference points now permitted by the regulation. Because the axes and seismic mass centers of the triaxial accelerometer (Endevco model 7267C-750) currently used in dummy testing are permanently fixed and the threaded holes for its mounting are predrilled, there should be no variability in accelerometer positioning between different users.

Costs

The agency has assessed the economic and other impacts of the proposed change to the accelerometer requirements and determined that they are not significant within the meaning of Executive Order 12044 and the Department of Transportation's policies and procedures for implementing that order. Based on that assessment, the agency concludes further that the economic and other consequences of this proposal are so minimal that a regulatory evaluation is not warranted. The impact is minimal since the only effect of the rule is to bind the agency to using one of the two types of accelerometers currently permitted by the regulation. The economic impact on manufacturers choosing to purchase triaxial accelerometers for their testing is small. The cost of the two triaxial accelerometers needed to instrument the dummy is approximately $2,500. Because the impact is so minimal, the agency is also setting a 30-day comment period.

Interested persons are invited to submit comments on the proposal. It is requested but not required that 10 copies be submitted.

All comments must be limited not to exceed 15 pages in length. Necessary attachments may be appended to these submissions without regard to the 15 page limit. This limitation is intended to encourage commenters to detail their primary arguments in a concise fashion.

If a commenter wishes to submit certain information under a claim of

confidentiality, three copies of the complete submission, including purportedly confidential information, should be submitted to the Chief Counsel, NHTSA, at the street address given above, and seven copies from which the purportedly confidential information has been deleted should be submitted to the Docket Section. Any claim of confidentiality must be supported by a statement demonstrating that the information falls within 5 U.S.C. section 552(b)(4), and that disclosure of the information is likely to result in substantial competitive damage; specifying the period during which the information must be withheld to avoid that damage; and showing that earlier disclosure would result in that damage. In addition, the commenter or, in the case of a corporation, a responsible corporate official authorized to speak for the corporation must certify in writing that each item for which confidential treatment is requested is in fact confidential within the meaning of section 552(b)(4) and that a diligent search has been conducted by the commenter or its employees to assure that none of the specified items has previously been disclosed or otherwise become available to the public.

All comments received before the close of business on the comment closing date indicated above will be considered, and will be available for examination in the docket at the above address both before and after that date. To the extent possible, comments filed after the closing date will also be considered. However, the rulemaking action may proceed at any time after that date, and comments received after the closing date and too late for consideration in regard to the action will be treated as suggestions for future rulemaking. The NHTSA will continue to file relevant material as to becomes available in the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new material.

Those persons desiring to be notified upon receipt of their comments in the rules docket should enclose, in the envelope with their comments, a self addressed stamped postcard. Upon receiving the comments, the docket supervisor will return the postcard by mail.

The principal authors of this notice are Vladislav Radovich, Office of Vehicle Safety Standards, and Stephen Oesch, Office of Chief Counsel.

In consideration of the foregoing, the following amendments are proposed in Subpart C—3-year-old Child of Part 572, *Anthropomorphic Test Dummies*, of Title 49 of the Code of Federal Regulations:

PART 572—ANTHROPOMORPHIC TEST DUMMIES

1. The first sentence of § 572.16(b) would be revised to read as follows:

§ 572.16 [Amended]

* * * * *

(b) When the head is impacted in accordance with paragraph (c) of this section by a test probe conforming to § 572.21(a) at 7 fps., the peak resultant accelerations measured at the location of the accelerometers mounted in the headform in accordance with § 572.21(b) shall be not less than 95g and not more than 118g. * * *

* * * * *

2. Section 572.21(b) would be revised to read as follows:

§ 572.21 [Amended]

* * * * *

(b) Accelerometers are mounted in the head on the mounting block (A/310) located on the horizontal transverse bulkhead as shown in the drawings subreferenced under assembly SA 103C 010 so that their sensitive axes are positioned as specified in this paragraph relative to the head accelerometer reference point located at the intersection of a line connecting the longitudinal centerlines of the transfer pins in the sides of the dummy head with the midsagittal plane of the dummy head. One accelerometer is aligned with its sensitive axis parallel to the vertical bulkhead and midsagittal plane and with its seismic mass center located 0.2 inches dorsal to and 0.1 inches inferior to the head accelerometer reference point. Another accelerometer is aligned with its sensitive axis in the horizontal plane and perpendicular to the midsagittal plane and with its seismic mass center located 0.1 inch inferior to, 0.4 inches to the right of and 0.9 inch dorsal to the head accelerometer reference point. A third accelerometer is aligned with its sensitive axis parallel to the midsagittal and horizontal planes and with its seismic mass center locate 0.1 inches inferior to, 0.6 inches dorsal to and 0.4 inches to the right of the head accelerometer reference point. All seismic mass centers shall be positioned within ± 0.05 inch of the specified locations.

3. Section 572.21(c) is amended to read as follows:

§ 572.21 [Amended]

* * * * *

(c) Accelerometers are mounted in the thorax on the mounting plate attached to the vertical transverse bulkhead shown in the drawings subreferenced under assembly No. SA 103C 030 in drawing SA 103C 001 so that their sensitive axes are orthogonal and their seismic masses are positioned relative to the thorax accelerometer reference point located in the midsagittal plane 3 inches above the top surface of the lumbar spine and 0.3 inches dorsal to the accelerometer mounting plate surface. One accelerometer is aligned with its sensitive axis parallel to the vertical bulkhead and midsagittal planes and with its seismic mass center located 0.2 inches to the left of, 0.1 inches inferior to and 0.2 inches ventral to the thorax accelerometer reference point. Another accelerometer is aligned with its sensitive axis in the horizontal transverse plane and perpendicular to the midsagittal plane and with its seismic mass center located 0.2 inches to the right of, 0.1 inches inferior to and 0.2 inches ventral to the thorax accelerometer reference point. A third accelerometer is aligned with its sensitive axis parallel to the midsagittal and horizontal planes and with its seismic mass center located 0.2 inches superior to, 0.5 inches to the right of and 0.1 inches ventral to the thorax accelerometer reference point. All seismic mass centers shall be positioned within ± 0.05 inch of the specified locations.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegations of authority at 49 CFR 1.50 and 501.8)

Issued on June 17, 1980.

Michael M. Finkelstein,

Associate Administrator for Rulemaking.

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